Technical Manual

Mobile Printer 2000

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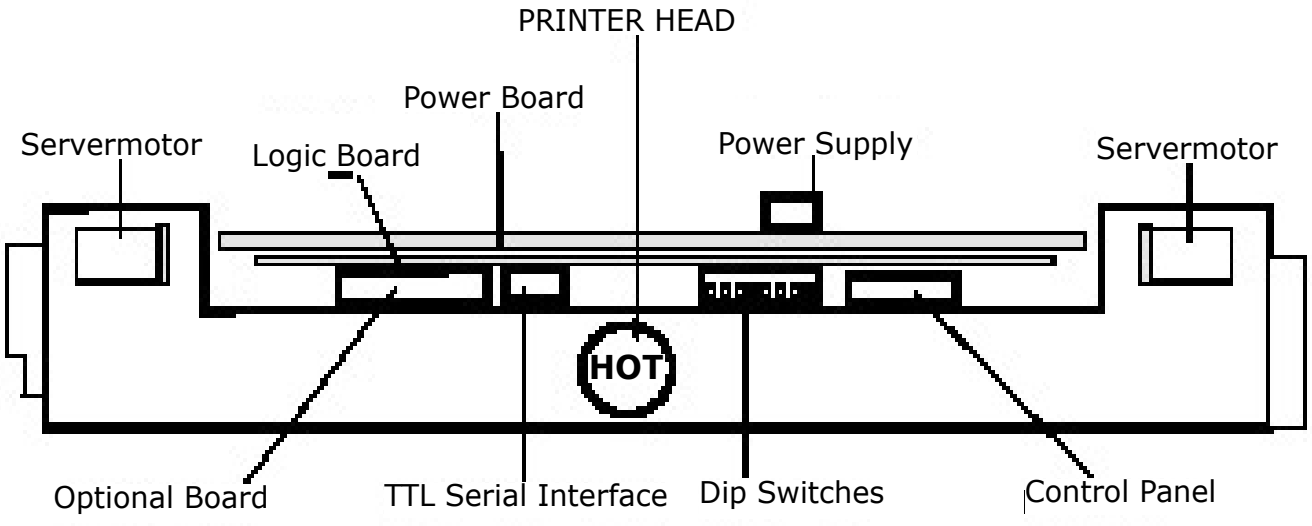
1. DESCRIPTION

1.1 Printer Overview



Product Outline

MP 2000 is an impact dot matrix printer with tractor and friction feed mechanism for use in mobile environments.

The mechanism is equipped with a ballistic nine needle printing head, it is able to print at 150 cps in draft mode and 25 cps in NLQ (Near Letter Quality) mode on multi-copy paper (one original and up to four copies).

Due to its compact size and reduced weight (2.2 kg), the MP 2000 is particularly suited for portable applications.

Power requirements have been kept to a minimum by means of two DC motors with integrated optical encoders. Using an integrated driver board, this ensures the same precision positioning in comparison to stepping motors.

The MP 2000 can print in the graphics mode along with different character fonts, both in draft and NLQ mode. It has also been developed mainly for portable applications, e.g. when connected to a lap-top.

MP 2000 comes standard with 2 Kbytes input buffer and comes with the following choices of interfaces:

- TTL - level serial interface
- RS-232 serial interface
- Parallel interface
- IRDA infra red

The interface flexibility ensures that the MP 2000 can work with almost any computer system. The MP 2000 is software driven. It is compatible with the driver software of EPSON LX 400 / LX800 and comes with his own windows ’95 and NT drivers.

1.1.1 Control Panel

The control panel is connected to the printer. It is fitted with four push buttons and three LED's.

1.1.2 Push Buttons

On line / Off line

This push button switches the printer on and off line. When the printer is "ON LINE", it is ready to accept data from the computer.
Likewise when it is switched "OFF LINE", the carriage automatically moves to the center of the print span. When "ON LINE" the printer ignores the remaining push-buttons (FF, LF, BF).

Form Feed

Paper advances by one sheet length (i.e. to the beginning of next page).

Line Feed

Paper advances by one line.

Back Feed

Paper retracts by one line.

When MP 2000 is "OFF LINE", the combined activation of the "ON LINE" and "FORM FEED" push-buttons causes the printer to go "ON LINE". It assumes then the actual paper position as "beginning of page". Three beeps are generated to acknowledge the operation.

1.1.3 Signal Lights

Power

This indicator lights when the printer is correctly powered. When power voltage is under 11.5 Vdc the "POWER" indicator flashes at 1 Hz rate. If the printer is battery operated, and the "POWER" indicator flashes at 1Hz rate, this means that the battery pack is almost discharged, although the printer can still be operated for some time. Flashing can be ignored or switched off (see 4.2.7).

On Line

This indicator turns on when the printer is ready to accept data. If the "ON LINE" led flashes at 1 Hz rate, the printer switches automatically to "STAND-BY" mode (see 4.2.20).

Paper End

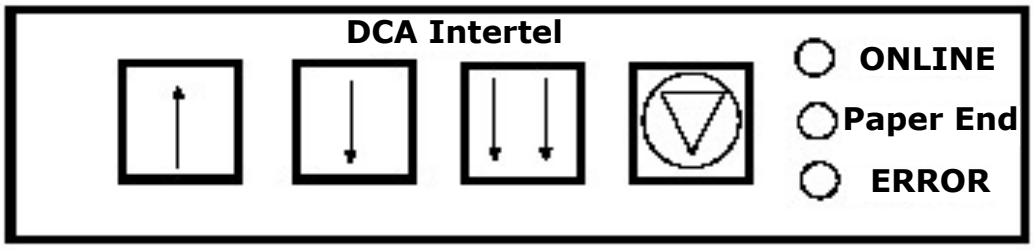
Comes on when the printer is out of paper.

ERROR indicator (special functions)

If the error indicator flashes and the "POWER ON" indicator flashes, this means that the battery pack voltage has gone below the operating voltage. It is recommended to turn the printer off in order to avoid the battery pack from getting damaged.

If the error indicator flashes and the "ON LINE" indicator flashes, this means that the motor is locked due to some mechanical fault. It is recommended to turn the printer off to avoid battery pack from over discharging.

After a "PAPER END" condition, when the printer is switched "ON LINE" after inserting new paper, the actual paper position is assumed to be the "beginning of page".



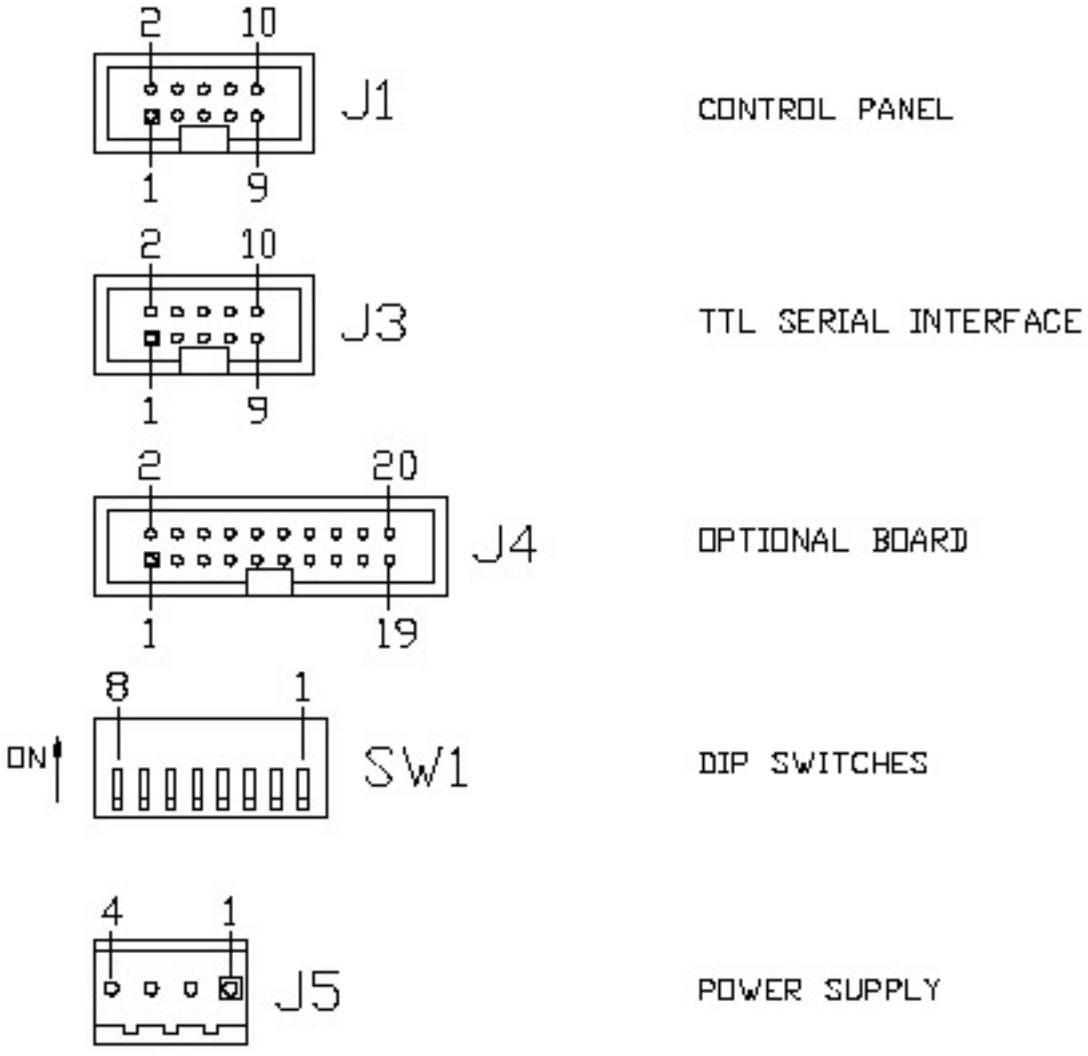
1.2 Connectors

See figure for connector pin numbering

Specification for logic levels are the following:

Output J1
low level: Vol < 0.5 Volt, Iol = 5mA
high level: Voh > 4.5 Volt, Ioh = -5mA

Input J1
low level: Vil < 0.8 Volt, Iil = -1.6mA
high level: Vol < 2.2 Volt, Iih = 200µA



1.3 Sensor - Paper End

A reflective sensor is used on the MP 2000 to detect the "PAPER END" condition. When this sensor detects the end of the currently printed sheet, the following takes place:

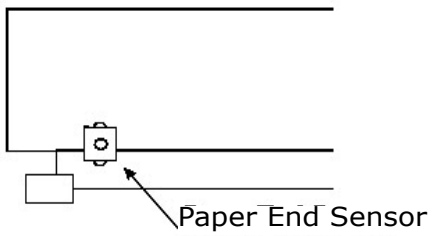
a: printing stops
b: the printer switches to "OFF LINE" (ON LINE indicator goes off)
c: PE (Paper End) indicator comes on.
d: carriage moves to middle of the printing span.

In order to resume printing, a new sheet should be loaded and then press the "ON LINE" button.
When the printer runs out of paper, this condition is signalled via the serial port by automatically issuing a "status byte" every 100 ms; bit 2 of status will be at logic "1" as follows:
paper present: bit 2 = PE = 0
out of paper: bit 2 = PE = 1

The "PAPER END" sensor is also used to detect an "open mechanism" condition; in fact when the mechanism is open the sensor no longer detects the sheet and actions described in a, b, c and d take place. The carriage moves to the center until a new sheet is introduced. The printer mechanism is closed and the "ON LINE" push-button is pressed.

The "PAPER END" sensor can be disabled using control sequence ESC 8; if disabled, printing can take place even on the bottom edge of the sheet. The disabling sequence must be done before any out-of-paper condition develops, should the input buffer contain some unprinted characters, the disabling sequence would only add up in the queue never to be executed.

The sensor status can be polled at every line by requesting the printer status; when PE is active, approximately 10 character lines can be printed before the sheet terminates (with 1/6" line spacing).



1.4 Sensor - Automatic Form/Paper loading and advance

The MP 2000 with serial interface has the ability to accept single forms.
By inserting a single form sheet (with a maximum of four copies) in the printer, the paper will automatically go to "Top Of Form". After the printing is finished, the paper/ form will automatically be ejected. To use this feature, the following software command settings have to be made.

MP 2000 TOF SETTING

-TOF driver with new board
-Possibility to read the TOF state by the host
-Automatic loading form/paper
-Form ejection over the feeding shaft
-Possibility to feed quickly forward/backward on "n" lines

OPERATIONS MADE ON DEFAULT

On default the printer ignores the PE detector. This allows the host to have the printer "ON-LINE" with or without paper. This condition is necessary to automatically load form/paper.

The PE detector can be switched on when required.

COMMAND FOR AUTOMATIC FORM AND PAPER LOADING

ESC #l+b+d+n ("l" is an "L" in lowercase)

b = 0/1; Activates the beep signal when waiting for loading of paper.
d = Indicates the delay in increments of 5 msec. The PE detector is activated prior to motor starting for the form feed function.
n = When TOF sensor is activated, the form goes up by multiples of 1/216 inches to TOF.

The printer waits for the paper to be loaded at the back of the unit, then the interlining motor will move until the TOF sensor is activated. From this position the paper goes back n/216 inches, this new position is the Top Of Form.

The range of the parameter "n" is between 0 and 255 (approximately 0..30 mm).

This command must be sent before every automatic loading.

FORM EJECT COMMAND

ESC #e

The printer starts to eject the form until the PE detector is inactivated adding a "safety time". Before ejecting, the printer will print out the line buffer contents and disactivates the PE detector.

QUICK JUMP COMMAND

ESC #j+d+n

The printer makes a forward or backward feed of the paper of "n" lines.

d= 0 (binary or ASCII): forward feed
d= 1 (binary or ASCII): backward feed
n= number of lines (the dimension is set up by the proper command) to feed.

The paper feeding is limited according to the form dimensions. The dimension is set up by the proper command (default 11 inches): it is not possible to go backward over the top of the form or to go forward over the edge of the form.
Before the feeding of the paper, the printer will print out the contents of the line buffer.

READING OF TOF STATUS

It can be read on bit "b1" of the status byte: 1 = TOF sensor covered.
The TOF sensor is detected by regular periods.

During the form setting, the sampling is quicker than normal, in order to have more precise precision. In all the other operating conditions, the TOF signal is tested every 100 msec.

2. INSTALLATION

2.1 Unpacking

Take the printer out of its shipping box and remove any padding material. It is advisable to keep the shipping box in case the printer needs to be re-shipped for repair, replacement or placed into storage.

2.2 Procedure for Installation

Mechanical Installation

Paper movement should meet the following requirements:
−Paper should be guided to remain in a right angle position in line with the printer. The printer does not feature any paper alignment device but only paper advancing/ retracting means. Therefore, any paper that is off-axis, misalignment cannot be corrected by the printer.
−Paper should remain parallel to the printing plane, also past the paper advancing devices (sprocket tape/friction rollers) and particularly under the print head.

2.3 CAUTION!

• Do not print without inked ribbon or paper, this can lead to rapid print head needle wear- out.
• When switching the printer on, it is advisable to check that the inked ribbon is in place. (see Illustration: Cartridge installation.)
• Avoid putting foreign matters into the printer.
• Avoid moving the print head manually.
• Avoid mechanical shocks to the electronic boards and to the printing mechanism.
• Before starting to print, check that the inked ribbon cartridge is correctly installed, the paper is loaded in the proper position and printer's upper swivelling part is locked to the lower one.
• If the printer has worked for some time, avoid touching the print head: it can be overheated. It is advisable to wait a few minutes before attempting to replace the inked ribbon cartridge.
• Once the printer has been switched off, wait at least 10 seconds before switching it on again, this enables the internal reset circuitry to work properly.
• Printer noise increases if the sheet is not in tight contact with the printing plane.
• Do not open the printer when it is operating.
• Switch the computer on before the printer and switch the printer off before the computer.
• This avoids dummy data being sent by the computer to the printer during the switching on/off sequence.
• Cleaning: do not use abrasive cleaners, unplug from mains before cleaning the printer.

2.4 Power Supply

The MP 2000 should be powered by a direct current source whose voltage falls strictly within the following range : +10.8 to + 14.0 Vdc.

Owing to the print head's needle firing, it is important to consider that the printer, acts as a very discontinuous loads with I max. abs = 30A for 600 µs, and I max. typ = 20 A for 300 µs: peak repetition frequency is 900 Hz.
The power supply should therefore be able to deliver high peak currents without overshooting the absolute Vmax. The ripple value should always remain within the input voltage's operating limits. The specification of the supply should be particularly checked for the application whenever a switching power supply (SPS) is used, generally these exhibit a longer recovery time than their linear counterparts.

Any overvoltage or undervoltage, even for a short duration, can cause respectively electronic circuit damage or microprocessor malfunction and should therefore be avoided. The same applies for electrostatic charges exceeding 5kV applied to the printer's frame.

The MP 2000 has been particularly developed for portable and battery operated systems; in the latter application, the following points should be noted:

• When the supply's voltage is under the low threshold of 11.5V (batteries nearly drained) the "POWER ON" indicator flashes. This function can be disactivated by means of the ESC #C n control (see 4.2.7.)
• When the voltage drops below 10.5 V (batteries drained) the printer stops working while the Error indicator intermittently and the "POWER ON" indicator flashes. To reset this error condition you need to switch the printer off, recharge the battery pack and then switch the printer on again.

2.5 Printer Set up

The MP 2000 can operate with different hardware/software. It can be configurated by using the SW1/SW2 DIP-switch set, as shown in Fig. 3 The function of the DIP-switches is shown in Table 3.

TABLE 3 - DIP SWITCHES

Dip Switch	Function		
SW1-1	Baud rate (see table 4)		
SW1-2	Baud rate (see table 4)		
SW1-3	for serial interface: ON = XON/XOFF mode OFF= DTR/DSR mode		
SW1-4	National character set (table 5)		
SW1-5	National character set (table 5)		
SW1-6	National character set (table 5)		
SW1-7	CRLF mode:	ON= enabled	OFF= disabled
SW1-8	STAND-BY mode:	ON= enabled	OFF= disabled

NOTE: Factory standard setting: 4,5,6, ON

TABLE 4 - BAUD RATE SELECTION

Baud rate	SW1-1	SW1-2
1200	ON	ON
2400	OFF	ON
4800	ON	OFF
9600	OFF	OFF

TABLE 5 - NATIONAL CHARACTER SET SELECTION BY DIP SWITCH

National character set	SW1-6	SW1-5	SW1-4
USA	ON	ON	ON
FRANCE	ON	ON	OFF
GERMANY	ON	OFF	ON
GREAT BRITAIN	ON	OFF	OFF
DENMARK	OFF	ON	ON
SWEDEN	OFF	ON	OFF
ITALY	OFF	OFF	ON
SPAIN	OFF	OFF	OFF

Table 3 - Instructions

Using DIP switches SW1-4/5/6 a particular National Character Set can be selected; this selection modifies the appearance of some characters according to table 10. Software command "ESC R n" (see further) has priority over DIP-switch selection.

CRLF MODE = ON means that after every CR character (carriage return) sent by the host, the printer automatically performs a LF (Line Feed) operation.
STAND BY MODE = ON: means that after a certain pre-set inactivity time (default setting is 20 seconds) the printer switches to stand-by mode with 50% power drain reduction.

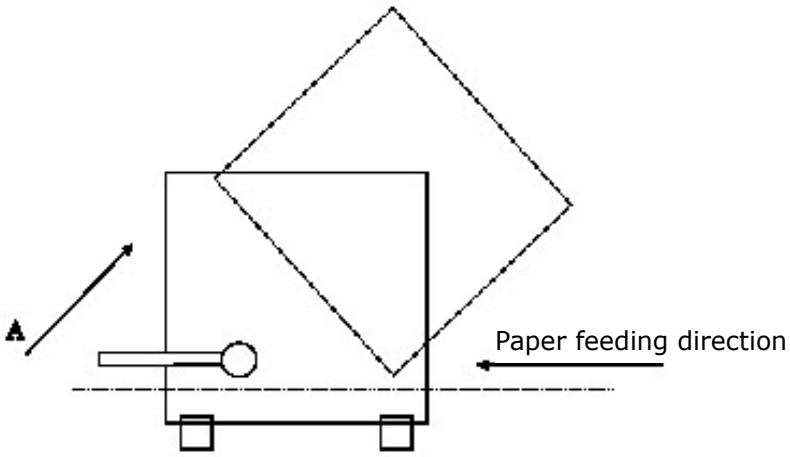
Some of the settings selected using DIP-switches can be modified using software commands; if the DIP-switch settings are changed while the printer is on, the new configuration will be working after the printer is switched off and on.

2.6 Paper Loading

MP 2000 can print on DIN A4/A5 size single sheet paper/forms or multi part paper/ forms or continuous fan-fold paper with hole to hole spacing of 227 mm (8.94").

See figure for correct paper loading.
The procedure for a correct paper loading is the following:

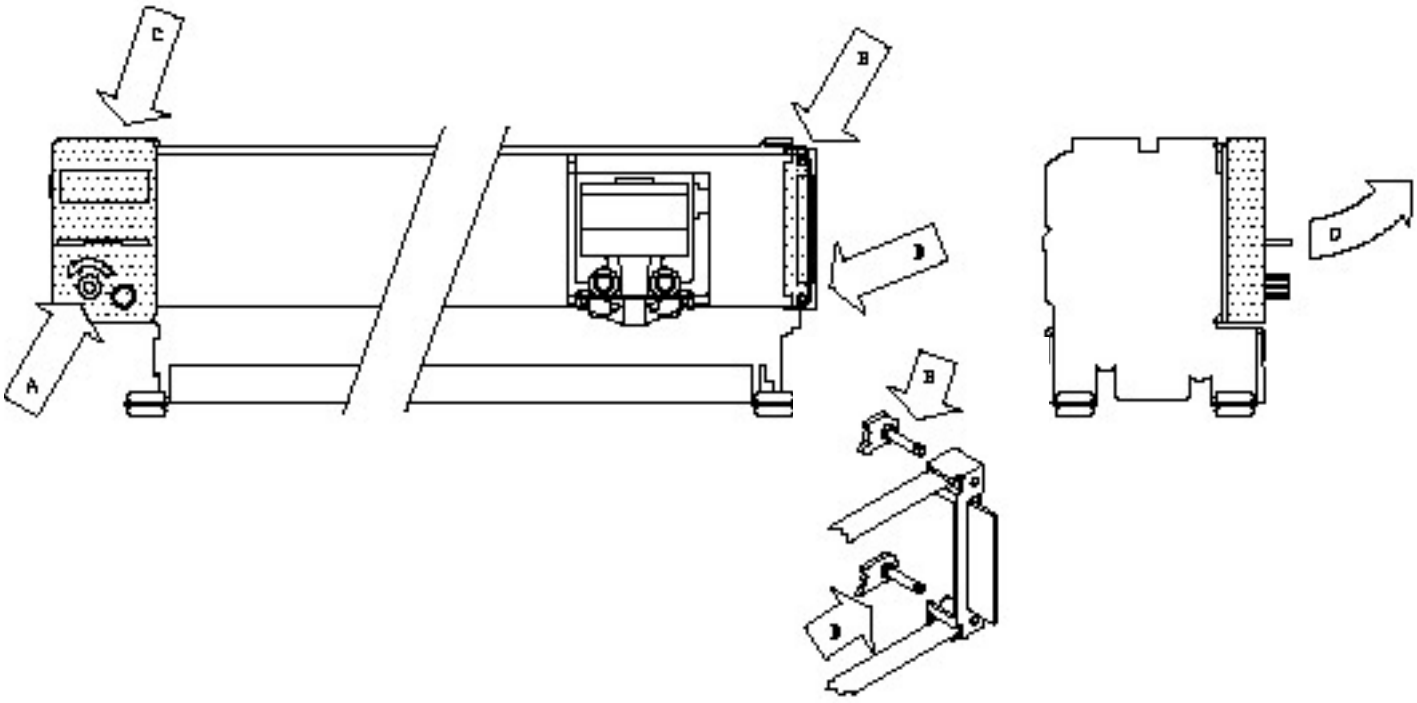
1) Set the printer "OFF LINE" pressing the relevant push-button
2) Open the printer by lifting lever A. (Fig. 1)
3) Insert single-sheet paper module by placing it over the printing plate, checking that it is equally spaced with the printing area; in case of continuous fan-fold paper, be sure that the sprockets do engage correctly in the holes provided near to the paper edges.
4) Close the swivelling printer top and switch the printer "ON LINE".



2.7 Inked Ribbon Cartridge Installation and Replacement

Cartridge Installation/Replacement Procedure:

1) Switch the printer off.
2) Remove used cartridge by unlocking the bottom latch and rotating cartridge body upwards as shown by arrow D.
3) Place ribbon extender on both studs B until it locks down, paying attention to the ribbon not disengaging from the extender.
4) Move the cartridge body gently along the printing axis and place it down on holder C; the ribbon should partly enter in the gap between the steel-wire ribbon holder and the print head nose
5) Stretch the inked ribbon by turning knob A clockwise
6) Turn the printer on without loading any paper; make sure that after the switch-on side movement of the print head, the ribbon is properly positioned under print head's



2.8 Self Test

The printer is able to perform an internal self-check routine followed by a self test printout.
There are two different self test modes:

- Demonstration Test
To execute this procedure, simply keep the "LINE FEED" push-button pressed while the printer is powered up. The test procedure prints the first page where general information about MP 2000 is given and the second page showing the different fonts.

- Continuous Alphanumeric Test
To execute this selftest, it is necessary to keep the BACKFEED push-button pressed while powering up the printer. The test produces a printout of the current software version, followed by printing all the characters from 20hex and 7Fhex, each followed by a space (40 characters per line, 66 lines per page).

3.0 INTERFACES

3.1 TTL Interface

Serial Data Format:

-1 start bit
-8 data bits
-No Parity
-1 stop bit

The transmission rate is selectable within the following values: 1200/2400/4800/9600 Baud.

Baud rate selection is performed by setting dip-switches SW1-1and SW1-2 according to paragraph 2.5 Most important is to set SW1-3 according to the chosen serial interface, this being the protocol XON-XOFF (XON = 17dec.= 11hex; XOFF = 19dec = 13hex) or the

DTR-DSR (hardware flag) mode. The TTL level control signals are as follows:

- TxD (output) Transmit Data.
  The printer sends data to the computer over this line; when idle, this line is at logic "1".
- RxD (input) Receive Data.
  The printer receives data transmitted from the computer over this line; idle at logic "1".
- DTR (output) Data Terminal Ready:
  "0" = printer is ready to receive data
  "1" = printer is busy and cannot receive data.
- DSR (input) Data Set Ready
  Controls data exchange from printer to computer
  "0" = printer can send data
  "1" = printer cannot send data.

 **NOTE:** the terms "input" and "output" refer to the printer.

Table 6 shows the pinout for connector J3 (10 way flat cable), used to connect the printer to the host computer.

TABLE 6 - TTL SERIAL INTERFACE CONNECTOR J3

PIN	DIRECTION	FUNCTION
01	output	+Vp for suppl. ext. dev. Imax=200mA
02	output	+Vp for suppl. ext. dev. Imax=200mA
03	output	+5V for suppl. ext. dev. Imax=20mA
04	output	+5V for suppl. ext. dev. Imax=20mA
05	output	TXD
06	input	RXD
07	output	DTR
08	input	DSR
09	output	GND
10	output	GND

3.2 RS 232- Serial Interface

The printer's serial TTL port is adapted to RS 232 C Standard interface. The pinout is shown in Table 7.

TABLE 7 - RS-232C SERIAL INTERFACE CONNECTOR (DB 9)

Connection from Serial Cable Male to Female

01		----------	01	
02	RX	----------	03	TX
03	TX	----------	02	RX
04	DTR	----------	06	DSR
05	GND	----------	05	GND
06	DSR	----------	04	DTR
07	RTS	----------	08	CTS
08	CTS	----------	07	RTS
09	RI	----------	09	RI

3.3 Parallel Interface

The parallel interface board allows for data exchange with the printer under the centronics parallel protocols. The pinout is shown in Table 8.
The parallel interface board can't be used at the same time with the T.O.F. sensor.

TABLE 8 - PARALLEL INTERFACE CONNECTOR

PIN	SIGNAL	DESCRIPTION	DIRECTION
01	/STROBE	STROBE for data read-in	IN
02	D0	DATA 0	IN
03	D1	DATA 1	IN
04	D2	DATA 2	IN
05	D3	DATA 3	IN
06	D4	DATA 4	IN
07	D5	DATA 5	IN
08	D6	DATA 6	IN
09	D7	DATA 7	IN
10	/ACK	new data request	OUT
11	BUSY	data received	OUT
12	PE	paper error/paper end	OUT
13	SLCT	printer is ON	OUT
14	/AUTO FEED XT	automatic LINE FEED request	IN
15	/ERROR	printer error	OUT
16	/INIT	printer initialise	IN
17	/SLCT-IN	not connected	(IN)
18	..25 GND	GROUND	IN/OUT

4. PRINTER FUNCTION

4.1 Printing Formats

MP 2000 can print in different styles and formats, which can be selected by using suitable command sequence (character strings preceded by the ESC character: Escape = 27 dec = 1 Bhex)
A selection of different styles can be performed during the actual printing of the document.

Two basic print qualities can be selected:
- DRAFT
- NLQ (Near Letter Quality)

When NLQ is selected two styles can be chosen:
- Roman
- Sans Serif

Following print densities are available:

5 6 8.57 10 12 17.14 20 CPI (characters per inch)

4.2 Control characters

Note: Each command is described as follows:

ESC.. (name of command)
Format:
ASCII: (character sequence in ASCII standard)
decimal: (character sequence in decimal numbers)
hexadecimal: (character sequence in hexadecimal num.)

Comment:
(description of the command functions)

Some of the commands take an input parameter in order to enable or disable a particular function; in this case either codes 00hex and 01hex or ASCII character 0 and 1 (30hex and 31hex) can be used.

Commands are executed immediately after they have been received; it should be kept in mind, however, should the input buffer not be empty, the incoming commands will be appended to the buffer queue and will be executed only after the preceding characters are printed.

4.2.1 RESET (OPERATING COMMANDS.)

ESC @		Printer reset
Format:		
ASCII:	ESC	@
decimal:	27	64
hexadecimal:	1B	40

Comment:
The printer is reset to the initial conditions and default settings. ASCII code 64 can represent different characters according to the national character set used and the code could therefore appear with different symbols on the keyboard(see table 10)

4.2.2 Aligment Tuning

ESC # J n		Bidirectional alignment tuning		
Format:				
ASCII:	ESC	#	J	n
decimal:	27	35	74	n
hexadecimal:	1B	23	4A	n

Comment:
0 ≤ n ≤ 20, default value 0hex ≤ n ≤ 14hex).

This command allows for the fine tuning of the print head alignment during bidirectional print. The fine alignment is required when extended ASCII graphic characters are used (from 176 dec to 223 dec)

These graphic characters are normally printed bidirectionally, unless when unidirectional print is forced (ESC< and ESC U n commands). Graphics mode and NLQ mode printing always take place unidirectionally. Alignment verification can be performed using the BASIC program that follows; fig 15 shows how alignment is affected by different values of "n". By changing the default value, fine alignment tuning can be obtained for both printing directions. Resolution is 1/480" (0.053mm) for each "n" unit.

4.2.3 Print direction and speed

ESC s n		Half speed enable/disable	
Format:			
ASCII:	ESC	s	n
decimal:	27	115	n
hexadecimal:	1B	73	n

Comment:
n = 1 enables half speed printing
n = 0 restores standard full speed printing

ESC <		One line unidirectional printing	
Format:			
ASCII:	ESC	<	
decimal:	27	60	
hexadecimal:	1B	3C	

Comment:
The current line is forced to be printed with print head moving from left to right. This command ceases after a CR (carriage return) is received.

ESC U n		Unidirectional printing enable/disable	
Format:			
ASCII:	ESC	U	n
decimal:	27	85	n
hexadecimal:	1B	55	n

Comment:
n = 1 enables unidirectional printing
n = 0 disables unidirectional printing

MP 2000 normally prints text with bidirectional print head movement. This command forces unidirectional print and allows for a more accurate text positioning.
Unidirectional printing can be useful when the ASCII extended graphic character set is used (from 176 dec to 223 dec.), which requires the finest vertical alignment tuning.

4.2.4 Page Control

FF		Form Feed
Format:		
ASCII:	FF	
decimal:	12	
hexadecimal:	0C	

Comment:
This comment forces all data in the input buffer to be printed and paper advanced by a length equal to the set page length.

ESC C n		Page length in lines	
Format:			
ASCII:	ESC	C	n
decimal:	27	67	n
hexadecimal:	1B	43	n

Comment:
Page length is set to “n” lines. The range for “n” is from 1 to 127 (01 hex....7Fhex) Physical page length is determined by the actual line spacing; maximum physical length is 12” and if a line spacing of 1/6” is chosen, the maximum value for “n” will be 72. The beginning of the page is assumed to be the current page position. Any bottom margin setting established by an ESC N n command is cleared whenever page length setting is changed. Default page length is set to 66 lines.

ESC C NUL n Page length in inches

Format:				
ASCII:	ESC	C	NUL	n
decimal:	27	67	0	n
hexadecimal:	1B	43	00	n

Comment:
Page length is set to "n" inches (1 inch = 25.2 mm), where "n" is ranged between 1 to 12 (01hex...0Chex). The beginning of the page is assumed to be the current page position. Any bottom margin setting established by an ESC N n command is cleared.

4.2.5 SENSORS

ESC 8 Disable Paper End Sensor

Format:		
ASCII:	ESC	8
decimal:	27	56
hexadecimal:	1B	38

Comment:
Paper End is disabled so that printing can be performed right down to the bottom edge of the sheet.

ESC 9 Enable Paper End Sensor

Format:		
ASCII:	ESC	9
decimal:	27	57
hexadecimal	1B	39

Comment:
Cancels the ESC 8 command. Paper End sensor is enabled.

4.2.6 PRINTER STATUS

ESC # S Printer status request

Format:			
ASCII:	ESC	#	S
decimal:	27	35	83
hexadecimal:	1B	23	53

Comment:
The printer responds to this command by sending to the host a status byte, where information about activity, batteries and paper are given as specified in the following table (obviously, the printer can respond only when it is ON LINE).

b7 b6 b5 b4 b3 b2 b1 b0

1 R R A B PE C R

where:
R means reserved: these bits are not meant to be handled by the user. Therefore these should not be used.

A means printer activity:
A=1 printer is ON LINE and is actually printing
A=0 printer is ON LINE and is waiting for data to be printed.

B means battery status:
B=0 batteries are charged
(supply voltage is over the 11.5 Vdc threshold)
B=1 batteries are low
(supply voltage is under the 11.5 Vdc threshold)

PE means paper sensor status:
PE=0 paper present
PE=1 out of paper

C means T.O.F. sensor status:
C=1 paper present
C=0 no paper

NOTE:If the printer detects an out-of-paper condition, and the paper end sensor has not been disabled by the ESC 8 command, the status byte is automatically sent back to the host (one transmission every 100 ms).
In this condition, although the printer is OFF LINE (see paragraph 1.3.2) the status byte may have bit A=1 (printer activity) if there are characters left in the input buffer still to be printed.

4.2.7 BUZZER CONTROL

BEL Sound the buzzer
Format:

ASCII:	BEL
decimal:	7
hexadecimal:	07

Comment:
This character makes the control panel buzzer emit a short beep.

ESC # C n Enable/disable LED flashing
Format:

ASCII:	ESC	#	C	n
decimal:	27	35	67	n
Hexadecimal:	1B	23	43	n

Comment:
n = 1 enables "POWER ON" LED flashing
n = 0 disables "POWER ON"LED flashing
This command allows for disabling the POWER ON Led flashing, that normally comes on when supply voltage goes under the 11.5 Vdc threshold. Disabling this function could be necessary when the printer is powered at a voltage value between 10.8 and 11.5 Vdc.

4.2.8 DATA CONTROL

CR		Carriage Return
Format:		
ASCII:	CR	
decimal:	13	
hexadecimal:	OD	

Comment:
All data in the buffer is printed and the carriage moves to the beginning of the line. If DIP-switch SW1-7 is ON, a Line Feed is automatically issued.

CAN		Cancel Line
Format:		
ASCII:	CAN	
decimal:	24	
hexadecimal:	18	

Comment:
Cancels all printable characters in the line preceding the command. It cannot cancel the control characters issued in the current line.

BS		(Backspace)
Format:		
ASCII:	BS	
decimal:	8	
hexadecimal:	08	

Comment:
All data stored in the input buffer are printed, then the print head is moved back by one print position for each BS character received, thus, allowing for character to over print. The command is ignored; if the printer is at the very beginning of a line or if the preceding character is HT (Horizontal Tab). The BS command should not be used when the center justified printing mode is selected (ESC a 1 command).

4.2.9 PAPER FEED

LF — Line Feed

Format:

ASCII:	LF
decimal:	10
hexadecimal:	OA

Comment:
All data in the input buffer are printed and the sheet advances by one line. The length of the actual fed paper is equal to the set line spacing.

ESC J n — Advance sheet by n/216 inch

Format:

ASCII:	ESC	J	n
decimal:	27	74	n
hexadecimal:	1B	4A	n

Comment:
Paper advances by n/216 of an inch (1/216" = 0.118mm).
The range for "n" should be from 0 to 255 (OOhex...FFhex).
This command does not move the carriage to the beginning of the next line nor does it affect subsequent lines: it can be seen as a means to obtain an immediate fractional line feed with no carriage return for specific paper positioning purposes. If a permanent fractional line spacing is required, command ESC 3 n should be used (see further on).

ESC 0 — Set line spacing to 1/8 inch

Format:

ASCII:	ESC	0
decimal:	27	48
hexadecimal:	1B	30

Comment:
Line spacing is set to 1/8 of an inch (3.175 mm) for subsequent line feed commands.
It should be noted that value "zero" in the command sequence is the ASCII code zero. (code 48 dec.)

ESC 1 — Set line spacing to 7/72 inch

Format:

ASCII:	ESC	1
decimal:	27	49
hexadecimal:	1B	31

Comment:
Line spacing is set to 7/72 of an inch (2.47 mm) for subsequent line feed commands.

ESC 2 Set line spacing to 1/6 inch

Format:

ASCII:		ESC	2
decimal:	27	50	
hexadecimal:	1B	32	

Comment:
Line spacing is set to 1/6 of an inch (4.23 mm) for subsequent line feed commands.

ESC 3 n Set line spacing to n/216 inch

Format:

ASCII:	ESC	3	n
decimal:	27	51	n
hexadecimal:	1B	33	n

Comment:
Line spacing is set to n/216 of an inch (1/216” = 0.118 mm) for subsequent line feed commands. The range for “n” is from 0 to 255 (OOhex...FFhex).

ESC A n Set line spacing to n/72 inch

Format:

ASCII:	ESC	A	n
decimal:	27	65	n
hexadecimal:	1B	41	n

Comment:
Line spacing is set to n/72 of an inch (1/72” = 0.353 mm) for subsequent line feed commands. The range for “n” is from 0 to 85 (00hex...55hex).

Note: When using uni A4 sheets on MP 2000 printer the minimum line spacing pitch becomes 1/217 of an inch (0.117 mm).
This modification affects the ESC J n and ESC 3 n commands which therefore respect the 1/217 inch pitch; the correct values for remaining line feed commands are 3.16 mm (ESC 0),
2.46 mm (ESC 1), 4.21 mm (ESC 2) and 0.351 mm (ESC A n).

4.2.10 VERTICAL MARGINS (FORMAT COMMANDS)

ESC N n		Set bottom margin	
Format:			
ASCII:	ESC	N	n
decimal:	27	78	n
hexadecimal:	1B	4E	n

Comment:
Set bottom margin to "n" lines from sheet's bottom edge; "n" ranges from 1 to 127 (01hex...7Fhex). Actual bottom margin length will be determined by the set line spacing.
Maximum value for the bottom margin is 12", internally limited by the printer. Any prior setting of bottom margin's length is cancelled when page length is modified by the ESC C n or ESC C NUL n commands.

ESC 0		Clear bottom margin
Format:		
ASCII:	ESC	0
decimal:	27	79
hexadecimal:	1B	4F

Comment:
Bottom margin is set to zero lines, when printing out on fan-fold paper, the printing can occur on the perforation unless the software in the host keeps track of the head's position on the page. This command can be used to clear any bottom margin set with an ESC N n command

ESC f 1 n		Vertical skip		
Format:				
ASCII:	ESC	f	SOH	n
decimal:	27	102	1	n
hexadecimal:	1B	66	01	n

Comment:
A vertical skip is performed by advancing the sheet "n" times the line spacing. No carriage return is executed.

4.2.11 VERTICAL TABS

VT		Vertical Tab
Format:		
ASCII:	VT	
decimal:	11	
hexadecimal:	0B	

Comment:
This command is used to predefine a vertical position within the page, for example, to facilitate form or table printing. These positions are called vertical tabs. Paper advances to the next position set in the current vertical tab setting (vertical channel). If no vertical tab setting has been selected by ESC / c the tab position set in vertical

channel "n" 0 is used. If no vertical tab has been set, the paper advances by one line. This command prints out all the remaining data left in the input buffer.

ESC B n1 n2...NUL Set vertical tabs

Format:				
ASCII:	ESC	B	n1	n2...NUL
decimal:	27	66	n1	n2...0
hexadecimal:	1B	42	n1	n2...00

Comment:
This command is used for setting up to 16 vertical tabs, to be performed at the current line spacing. Tab positions are entered as n1, n2...and so on (where "n" ranges from 1 to 255 dec) and are in increasing order (i.e. n1<n2<n3). The NUL character indicates the end of the command.
If the line spacing is modified after giving this command, tab positions are not affected. This command sets tabs for vertical setting no. 0 (channel 0). Tabs can be cancelled by the ESC B NUL command (i.e. by omitting parameters n1, n2 etc.)

ESC b c n1 n2...NUL Set vertical tabs channels

Format:					
ASCII:	ESC	b	c	n1	n2...NUL
decimal:	11	98	c	n1	n2...0
hexadecimal:	1B	62	c	n1	n2...00

Comment:
This command is similar to the ESC B command, by introducing parameter c, to select a particular vertical tabs setting; c will be within 0 and 7, thus making it possible to select up to 8 different vertical tab channels.
After the selection of vertical tabs channels are made by using ESC / c command. Character NUL indicates the end of the command; tabs settings can be cancelled by the ESC b NUL command (i.e. omitting parameters c n1 n2 etc.)

ESC / c Select vertical tabs channels

Format:			
ASCII:	ESC	/	c
decimal:	27	47	c
hexadecimal:	1B	2F	c

Comment:
All subsequent VT commands will make use of the vertical setting selected by the parameter c. c value ranges from 0 to 7.

ESC e 1 n Set vertical tabs increments

Format:				
ASCII:	ESC	e	SOH	n
decimal:	27	101	1	n
hexadecimal:	1B	65	01	n

Comments:
The increment of vertical tabs is set to "n" current line spacings.

4.2.12 HORIZONTAL MARGINS

ESC 1 n Set left margin

Format:			
ASCII:	ESC	l	n
decimal:	27	108	n
hexadecimal:	1B	6C	n

Comment:
The left margin is set to "n" columns from sheets edge, where the column width is equal to the current character width; "n" value ranges from 0 to 160 (00hex...A0hex), but it is ignored if a margin higher than 8 inches (230 mm) is selected. The left margin position depends on the printing character width and on the print format, double width or condensed. This command must be sent at the beginning of the line: all preceding data in the buffer from the same line, is lost. The correct character to send is the lower case "l"
("l" for left) and not, as it often occurs, the number 1 character. Minimum space between left and right margins is equal to the width of one 10 CPI (Pica) double width character.

ESC Q n Set right margin

Format:			
ASCII:	ESC	Q	n
decimal:	27	81	n
hexadecimal:	1B	51	n

Comment:
The right margin is set to "n" columns from sheet's edge where the column width is equal to the current character width. "n" value ranges from 1 to 255 (01hex...FFhex). The right margin position depends on the printing character width and on the print format, double width or condensed. This means that the maximum right margin is the rightmost column, which is less than 255.

This command must be sent at the beginning of a line, because all the data in the buffer preceding the command in the same line is lost, The minimum space between the left and right margin is equal to the width of one 10 CPI (Pica) double width character.

ESC f NUL n Horizontal skip

Format:				
ASCII:	ESC	f	NUL	n
decimal:	27	102	0	n
hexadecimal:	1B	66	00	n

Comment:
This command causes "n" spaces to be printed with no carriage return (CR). Maximum value for "n" can be 127 (01hex...7Fhex).

4.2.13 HORIZONTAL TABS

HT		Horizontal tabs
Format:		
ASCII:	HT	
decimal:	9	
hexadecimal:	09	

Comment: Pre-setting
Presetting of horizontal positions within the line is possible with the HT character, to facilitate for example form or table printing. By this command the print head is moved to the next position of horizontal tab setting. Horizontal tabs are initially set at intervals of 8 characters in the default PICA (10 CPI) format, which corresponds to one horizontal tab set every 8/10 of an inch (20.3 mm).
Further modifications of the character pitch do not affect horizontal tabs. For example, if we shift from Pica (10 CPI) to Elite (12 CPI) characters, the first tab will still be at 8/10 of an inch from the left margin and so on for subsequent tabs.

ESC D n1 n2...NUL		Set horizontal tabs		
Format:				
ASCII:	ESC	D	n1	n2...NUL
decimal:	27	68	n1	n2...0
hexadecimal:	1B	44	n1	n2...00

Comment:
This command allows for setting up to 32 horizontal tab positions. Tabs are represented by parameters n1, n2 etc., where "n" value ranges from 1 to 159 (01hex...9Fhex) in increasing order (n1<n2<n3 etc.). Maximum practical value for horizontal tab is equal to the maximum number of characters per line less 1 unit (see para. 5.2) The NUL character indicates the end of the command.

Tab positions depend on the character pitch set when this command is issued and will not be affected by a further modification of the character pitch. The command ESC D NUL (without parameters) clears all horizontal tabs. When the printer is turned on or initialised, tabs are set at intervals of 8 Pica characters, i.e. at intervals of 8/10 of an inch.

ESC e NUL n		Set horizontal tabs increments		
Format:				
ASCII:	ESC	e	NUL	n
decimal:	27	101	0	n
hexadecimal:	1B	65	00	n

Comment:
Horizontal tabs are set at regular intervals of "n" spaces. The maximum value that can be set depends on the current character width and is 21, 25 and 36 at 10 CPI, 12 CPI and condensed mode respectively. Default value at 10 CPI is n = 8.

4.2.14 TEXT JUSTIFICATION CONTROLS

ESC a n Select justification mode

Format:			
ASCII:	ESC	a	n
decimal:	27	97	n
hexadecimal:	1B	61	n

Comment:
It is often convenient to print one or more centered lines, or texts with right and/or justified margins. This command causes text justification to be automatically performed while printing. The type of justification set depends on the value assigned to n:
n = 0 left (default)
n = 1 centered
n = 2 right

Justification is performed when the printer receives a CR, LF or FF code, or when the input buffer is full. The ESC a n command should always be given at the beginning of a new line, as all data preceding it on the same line is lost. If bit image graphics elements and text elements are mixed in the line, justification is not performed properly.

4.2.15 PRINT QUALITY

ESC x n Select NLQ (Near Letter Quality) or draft mode

Format:			
ASCII:	ESC	x	n
decimal:	27	120	n
hexadecimal:	1B	78	n

Comment:
n = 0 selects draft mode
n = 1 selects NLQ mode
By selecting the NLQ mode the default font (Roman), or the last selected font, if any, is set.

ESC k n Select character font in NLQ

Format:			
ASCII:	ESC	k	n
decimal:	27	107	n
hexadecimal:	1B	6B	n

Comment:
Selects one of the two fonts available in NLQ
n = 0 Roman
n = 1 Sans Serif

ESC ! n Select master style

Format:			
ASCII:	ESC	!	n
decimal:	27	33	n
hexadecimal:	1B	21	n

Comment:
Selects a combination of styles listed in Table 9, where "n" is a figure obtained by summing up the identification numbers of the desired styles, e.g. to print a title in double width,
double strike Elite character the following values must be added:

Elite (12CPI)	1
double-strike	16
double-width	32
	---
n =	49

This command does not affect the print type selection in NLQ mode, that has to be separately set by the ESC x n or ESC k n commands. Subscript and superscript printing settings, if any, are not cancelled.

Table 9 - Master Style Selection:

STYLE	DECIMAL	HEXADECIMAL
10 CPI pitch (Pica)	0	00
12 CPI pitch (Elite)	1	01
Condensed	4	04
Emphasized	8	08
Double-strike	16	10
Double-width	32	20
Italic	64	40
Underline	128	80

4.2.16 PRINT PITCH (PRINTING STYLES)

print pitch is the number of characters printed in one inch (25.4 mm). The print pitch is expressed as "Characters Per Inch" or "CPI".

ESC P — Select Pica Characters (10 CPI)

Format:

ASCII:	ESC	P
decimal:	27	80
hexadecimal:	1B	50

Comment:
This command selects the Pica (10 CPI) pitch, which is the default character pitch.

ESC M — Select Elite pitch (12 CPI)

Format:

ASCII:	ESC	M
decimal:	27	77
hexadecimal:	1B	4D

Comment:
The Elite pitch allows for a greater print density (12 CPI)

4.2.17 CHARACTER WIDTH

SI — Select condensed printing

Format:

ASCII:	SI
decimal:	15
hexadecimal:	0F

Comment:
This command causes the characters be reduced by the 60% of their normal width and it is cancelled by the DC2 command.

ESC SI — Select condensed printing

Format:

ASCII:	ESC	SI
decimal:	27	15
hexadecimal:	1B	0F

Comment:
Equivalent to SI command.

DC2 — Cancel condensed printing

Format:

ASCII:	DC2
decimal:	18
hexadecimal:	12

Comment:
This command cancels condensed printing if activated by the SI or ESC SI commands.

SO — Select double width printing for 1 line

Format:

ASCII:	SO
decimal:	14
hexadecimal:	0E

Comment:
This command doubles the width of all characters for 1 line; it is cancelled either by a CR (carriage return) or a DC4 command.

ESC SO — Select double width printing for 1 line

Format:

ASCII:	ESC	SO
decimal:	27	14
hexadecimal:	1B	0E

Comment:
Equivalent to the SO command.

DC4 Cancel double width printing for 1 line

Format:

ASCII:	DC4	
decimal:	20	
hexadecimal:	14	

Comment:
This command cancels double width printing only if it has been activated by the SO or ESC SO commands; double width printing selected by the ESC W n or ESC ! n commands is not affected.

ESC W n Enable/disable double width printing

Format:

ASCII:	ESC	W	n
decimal:	27	87	n
hexadecimal:	1B	57	n

Comment:
n = 1 enables double width printing
n = 0 disables double width printing

4.2.18 PRINT STYLES

ESC E Select emphasized printing

Format:

ASCII:	ESC	E
decimal:	27	69
hexadecimal:	1B	45

Comment:
This command increases the character density by printing twice on the same dot, with the second stroke slightly shifted to the right with respect to the first one, this causes a reduction of the printing speed. The emphasized printing can be combined with double strike printing.

ESC F Cancel emphasized printing

Format:

ASCII:	ESC	F
decimal:	27	70
hexadecimal:	1B	46

Comment:
This command cancels the emphasized printing mode selected by the ESC E command.

ESC G Select double strike printing

Format:

ASCII:	ESC	G
decimal:	27	71
hexadecimal:	1B	47

Comment:
Each character is printed twice, with the second character printed slightly under the previous one. Double strike printing can be combined with emphasized printing. Double strike printing is not available in the NLQ mode, but the command is not cancelled if it has been sent before switching to NLQ mode.

When the Draft mode is reselected, double strike printing will resume until an ESC H command is given.

ESC H		Cancel double strike printing	
Format:			
ASCII:	ESC	H	
decimal:	27	72	
hexadecimal:	1B	48	

Comment:
Double strike printing mode, which was selected by the ESC G command, is cancelled.

ESC S n		Enable subscript/superscript mode	
Format:			
ASCII:	ESC	S	n
decimal:	27	83	n
hexadecimal:	1B	53	n

Comment:
n = 0 selects superscript mode
n = 1 selects subscript mode

The characters are reduced by two thirds of their standard height and printed on the upper/lower half of the area normally occupied by a character; underlining, if any, remains in the normal position.

ESC T		Disable superscript/subscript mode	
Format:			
ASCII:		ESC	T
decimal:	27	84	
hexadecimal:	1B	54	

Comment:
This command cancels superscript and subscript printing activated by the ESC S command.

ESC - n		Enable/disable underlining	
Format:			
ASCII:	ESC	-	n
decimal:	27	45	n
hexadecimal:	1B	2D	n

Comment:
n = 1 enables underlining
n = 0 disables underlining
All characters are printed underlined, including spaces.

4.2.19 NATIONAL CHARACTER SET

ESC 4 Select italics printing
Format:

ASCII:	ESC	4	
decimal:	27	52	
hexadecimal:	1B	34	

Comment:
Characters following this command are printed in italics.

ESC 5 Cancel italics printing
Format:

ASCII:	ESC	5	
decimal:	27	53	
hexadecimal:	1B	35	

Comment:
This command cancels italics printing selected by the ESC 4 command.

ESC R n Select national character set
Format:

ASCII:	ESC	R	n
decimal:	27	82	n
hexadecimal:	1B	52	n

Comment:
Parameter selects the national character set to be used, as shown in Chapter 8. This command has priority over the hardware selection performed by DIP-switches SW1-4/ 5/6.

4.2.20 POWER REDUCTION COMMANDS / select number of copies

ESC # s n Enable/disable automatic standby mode
Format:

ASCII:	ESC	#	s	n
decimal:	27	35	115	n
hexadecimal:	1B	23	73	n

Comment:
n = 0 disables the automatic standby mode.
n > 0 enables automatic standby mode, where "n" ranges from 1 to 25 and represents the time in seconds where the printer is inoperative before entering the standby mode (default time = 20 seconds).
In the standby mode the current drain is reduced by half by disabling all the circuitry not involved with receiving data from the computer.

NOTE:
When the printer switches off from the standby mode, the print head positioning procedure is performed and a shift of a few tenths of a millimetre on both the vertical and horizontal print head positions might occur.
It is possible to exit from standby mode at any time by sending the ESC # s 0 command or by pressing the "ON LINE" push button.

Vertical and horizontal position encoders are switched off in standby mode, therefore if the position of the print head and/or paper is modified, the printer will not be able to recover to the original position when it resumes printing.

ESC # P n Select number of copies
Format:

ASCII:	ESC	#	P	n
decimal:	27	35	80	n
hexadecimal:	1B	23	50	n

Comment:
Selects the number of copies, represented by n, where "n" ranges from 1 to 4. The lower is the "n" value, the lowest is consumption, as the command acts on the needle firing time.
Default value is 4.

4.3 CHARACTER SET

The standard character set (enclosures A) is IBM full ASCII 256 in all formats. The first 32 characters of the set are not printable, but are partly used as control characters.
It is also possible to set a specific national character set (see table 9) with SW1-4/5/6 or by sending the relevant control character.

4.3.1 Control characters printing (German characters)

ESC 6 Enable control character printing
Format:

ASCII:	ESC	6
decimal:	27	54
hexadecimal:	1B	36

Comment:
This command allows for printing characters from 128 to 159 that are normally used as control characters and therefore are not suitable to be printed. This command is used to enlarge the range of printable characters, or, when debugging of the interface between host and printer is needed. Normally the control character printing is enabled (default setting).

ESC 7 Cancel "ESC 6" commands

Format:

ASCII:	ESC	7
decimal:	27	55
hexadecimal:	1B	37

Comment:
This command, whose response is opposite to ESC 6, allows for using characters from 128 to 159 as control characters.

4.4 GRAPHIC CAPABILITIES

The graphics pattern is printed immediately; if the dots are more than the possible dotline, the printer begins an other line.
If you do not put CR at the end, everything that follows the graphics printed, is set sideways of it. The arrival of a graphics command causes the printing of the line buffer and sideways follows the graphics.

4.4.1 Graphics control characters

ESC * m n1 n2 data General bit image command

format:

ASCII:	ESC	*	m	n1	n2	… graphic data …
decimal:	27	42	m	n1	n2	… graphic data …
hexadecimal:	1B	2A	m	n1	n2	… graphic data …

Comment:
This command selects one of a number of bit image data modes according to the value of m in the following table 10.

Table 10

m	MODE	dots/inch	dots/mm
0	single density	60	2.36
1	low speed/double density	120	4.72
2	high speed/double density	120	4.72
3	quadruple density	240	9.45

n1 and n2 determine the number of "n" of a bit image data, which follw the command. Their values are calculated as follows:

n1 = d MOD 256
n2 = INT (d/256)

where d is the number of data bytes to be sent.

Note:
MOD is the modulus 256 operator (remainder of the division of d by 256); INT is the operator that yields the integer part of (d/256).

ESC K n1 n2 d select 8-bit single density bit image printing
format:

ASCII:	ESC	K	n1	n2	d
decimal:	27	75	n1	n2	d
hexadecimal:	1B	4B	n1	n2	d

Comment: Single density bit image mode is selected.
If d value represents the total number of columns:
n1 = dMOD 256
n2 = INT (d/256)

This has the same effect as "ESC" with m set to 0. It is also possible to define again "ESC K+ to select another mode using "ESC?".

ESC L n1 n2 d select 8-bit double density bit image printing
format:

ASCII:	ESC	L	n1	n2	d
decimal:	27	76	n1	n2	d
hexadecimal:	1B	4C	n1	n2	d

Comment: low speed double-density, bit image graphics mode is selected.

If d value represents the total number of colums:
n1 = dMOD 256
n2 = INT (d/256)

This has the same effect as "ESC" with m set to 1. It is also possible to define again "ESC K" to select another mode using
"ESC?".

ESC Y n1 n2 d select 8-bit double speed double density bit image printing
format:

ASCII:	ESC	Y	n1	n2	d
decimal:	27	89	n1	n2	d
hexadecimal:	1B	58	n1	n2	d

Comment: double speed, double density bit image graphics mode is selected.

If d value represents the total number of columns:
n1 = dMOD 256
n2 = INT (d/256)

This has the same effect as "ESC" with m set to 2. It is also possible to define again "ESC K" to select another mode using "ESC?".

ESC Z n1 n2 d select 8-bit quadruple-density image printing

format:

ASCII:	ESC	Z	n1	n2	d
decimal:	27	90	n1	n2	d
hexadecimal:	1B	5A	n1	n2	d

Comment: quadruple-density, bit image graphics is selected.

If d value represents the total number of columns:
n1 = dMOD 256
n2 = INT (d/256)

This has the same effect as "ESC" with m set to 3. It is also possible to define again "ESC K" to select another mode using "ESC?".

ESC ? n m re-assign bit image commands

format:

ASCII:	ESC	?	n	m
decimal:	27	63	n	m
hexadecimal:	1B	3F	n	m
keyboard:	CTRL[	?	see	below

Comment: One of the general bit image modes listed under "ESC * m n1 n2 data" is assigned to any of the commands "ESC K", "ESC L", and "ESC Z".
The value of m corresponds to the mode m in "ESC * n1 n2 data".
If control characters are being used this would be input by pressing CTRL and a key in the range @ to G.
n is the ASCII code for the command which is to be changed:
K, L, Y or Z; thus it is the character K, L, Y or Z which is sent.

5. TECHNICAL INFORMATION MP 2000

5.1 Technical Specifications

-printing housing	Caged enclosure(for EMI suppression) 3 parts made of 1 mm Stainless Steel Dampingpads for noise suppression
-printing method	dot matrix impact printing (ballistic, 9 pins)
-printing direction	horizontal, bi-directional printing with optimum path, logic search
-paper movement	forward/backward
-paper transport	friction and tractor
-printing speed	150 char/s in draft mode
-paper advance speed -draft mode:	150 ms/line typical (1/6” line spacing)
-NLQ and graphics mode	200 ms/line typical with intermittent paper advance (1/16” line spacing)
-Continuous line feeding ex formfeed	100 ms/line = 0.6 s/inch = 4.35 cm/s typical
-buffer capacity	2 KBytes
-MCBF	1.2x106 lines
-expected head life	300x106 strokes/needle, equal to 190x106 characters (given an average density of 14 dots/character).
-vibration test: 3 axis sinusoidal vibration test at resonance frequency	0.5 G for 15 min. along each axis
3-200 Hz random vibration (MIL-STD-810D/514.3)	1 G for 30 min. along each axis
-shock test (non-operational mode)	50 G for 8ms along each axis

5.2 Printing Specifications

-print quality:	
graphics	full bit image
alphanumerical	Draft/Roman NLQ/Sans Serif NLQ
-characters per line:	
pica	80 (10 CPI)
pica expanded	(5 CPI)
pica condensed	36 (17 CPI)
pica cons. and exp.	68 (8.5 CPI)
elite	96 (12 CPI)
elite expanded	48 (6 CPI)
elite condensed	160 (20 CPI)
elite cons. and exp.	80 (10 CPI)
-actual printing area	203.2 mm (8 Inches)
-resolution:	
vertical	216 DPI (8.50 dot/mm)
horizontal	240 DPI (9.45 dot/mm)
-dots per line	1920 max
-standard char. height	2.47 mm
-standard line spacing	variable within 1/216” and 255/216” (0.118 mm ...29.99 mm)
-character set	IBM FULL ASCII 256 (fig.)

5.3 Paper

-Type	MP 2000: DIN A4/A5 single sheet or continious forms
-width	210 mm (DIN A4/A5) 240 mm (continious forms)
-sprocket hole to hole distance	227 mm +/- 0.125 mm
-sprocket hole pitc	12.7 mm(0.5”)
-number of copies	3 + 1 original
-max thickness (original + copies)	0.25 mm
-weight	
1 original	55 + 90 gr/m2
copies	45 + 55 gr/m2
maximum module composition	(3x55 gr/m2) + (1x80 gr/m2)

5.4 Inked Ribbon Cartridge

-type	snap-on cartridge
-color	black/purple
-duration	purple: 1.2 x 106 characters temperature: 5° + 50°C black: 0.7 x 106 characters temperature: 10° + 50°C

5.5 Interfaces

TTL logic serial level (baud rate 1200/2400/4800/9600)
RS-232C serial board
Centronics parallel board

5.6 Sensors

-paper end	reflective sensor
-Top Of Form	reflective sensor

5.7 Power Supply

-voltage range	+10.8 + 14.0 Vdc
-current drain	
ON LINE, not printing	160 mA max
standby (selec. by SW1-8)	80 mA max
printing	2 A average value 20 A peak typical (for 600 µs) 30 A peak (for 300 µs max) peak repetition frequency 900 Hz

5.8 Environmental Limits

-operating conditions	
temperature	-5°...+40°C (+23°...+104°F)
relative humidity (not condensing)	15%...85% RH
-non operating conditions	
temperature	-15°...+70°C (+5°...+158°F)
relative humidity (not condensing)	5%...85% RH

5.9 Dimensions and Weight

-dimensions	
length	351 mm
height	82 mm
width	83 mm
-weight	2.2 kg

6. MAINTENANCE

6.1 Care and Cleaning

The MP 2000 does not require special maintenance, except for the following:

−Periodical cleaning, to the print head bearing rod with isopropylic alcohol or something similar.
−When the printer has suffered a major shock or whenever bad quality printing is experienced, you need to measure the distance between print head and printing plate. The distance, measured with a thickness gauge with the printer closed and no inked ribbon interposed, should be 0.55 mm +/- 0.05 mm.
−The printers mechanism requires regular cleaning to remove any foreign matters such as dust, paper chips etc., which can cause mechanism malfunctions.

7. WARRANTY

−The MP 2000 printer is subject to a strict factory quality control.
−This manufacturer's guarantee does not apply when improper use or non compliance to electrical, mechanical and environmental requirements.
−Partial or complete disassembling of the printer.
−Unauthorised replacement of the electrical and/or mechanical components
−This manual provides the user with all the necessary information required to make correct and effective use of the MP 2000 printer.
−Any comments or suggestions about our product will be very much appreciated.
−DCA policy is to pursue a continuous improvement of the quality of its products. For this reason the technical specifications contained herein may be subject to modification without notice.

8. SPAREPARTS BY ARTICLE NUMBER

TRA	Paper Tray
RBN	Inkribbon pkge of 4
2098001	Ruggedized Housing (Parallel or Serial)
2098002	Power Connector 2 PIN
2098003	Power Connector 3 PIN
2098004	DB 9 Serial Connector Female
2098005	DB 9 Serial Connector Male
2098006	DB 25 Parallel Connector Female
2098007	DB 25 Parallel Connector Male
2098008	Serial Interface (Board)
2098009	Parallel Interface (Board)
2098010	Paper End Sensor
2098011	Servomotor (Left)
2098012	Servomotor (Right)
2098013	Power Board
2098014	Logic Board
2098015	Printer Head
2098016	TTL Serial Interface Connector (J3)
2098017	Optional Board Connector (J4)
2098018	Control Panel Connector (J1)
2098019	Powersupply Connector (J5)
2098020	Flat Cable TL Serial Interface
2098021	Control Panel Mechanical
2098022	Control Panel New Version
2098023	Power Switch
2098024	Gear Wheel Brass
2098025	Gear Wheel ABS
2098026	Power Cable 2 PIN Connector
2098027	Power Cable 3 PIN Connector
2098028	Militair Dual Lock Tape (1 M)